391

U. S. FOREST SERVICE

RESEARCH NOTE LS-53

• LAKE STATES FOREST EXPERIMENT STATION • U. S. DEPARTMENT OF AGRICULTURE

A Field Key to the Adult Hymenopterous Parasites of the Spruce Budworm in Minnesota

The simple key presented here was devised for field identification of the various adult hymenopterous parasites of the spruce budworm (*Choristoneura fumiferana* (Clem.)) in Minnesota. Using easily recognizable morphological characters visible through a hand lens or low-power microscope, it was designed to separate genera only. This level is adequate for certain purposes. Where precise species identification is necessary, parasites should be sent to expert taxonomists.

The species listed in table 1 are all of the hymenopterous parasites recorded from thousands of specimens reared from 1956 to 1961 in northern Minnesota. Several of the genera contain only one species in this list, so that identification to that particular genus also will indicate a particular species. A few specimens could not be identified beyond the genus because of insufficient or incomplete material. At least two, and possibly three, new species were recovered in the rearings.

Key to Adult Hymenopterous Parasites

1. Forewings with two veins or less; insects 3 mm. or less in length (Figs. 1-3) 2
   Forewings with numerous veins; insects longer than 3 mm. (Figs. 4-9) 11

2. (1) Head, thorax, and abdomen yellow; body length about 0.5 mm. .....*Trichogramma*
   Head, thorax, and abdomen not yellow; body length 1.0 mm. or greater 3

3. (2) Head, thorax, and abdomen bright green or blue; legs uniformly brown or yellow 4
   Head, thorax, and abdomen black; body may be irridescent; legs and antennae not necessarily uniform in coloration 6

4. (3) Body light yellowish green; legs uniformly yellow; antennae with yellow scape and orange or brownish filament; abdomen shorter than head and thorax combined; 2.5 mm. long .....*Psychophagus*
   Body dark brownish green; legs and antennae uniformly brown; about 3.0 mm. long .. 5

5. (4) Abdomen robust, shorter than head and thorax combined, and its length less than twice its width; abdomen shining black except basal half of first abdominal tergite metallic green .....*Amblymerus*
   Abdomen elongated, longer than or as long as head and thorax combined, and its length more than twice its width; abdomen uniformly bright or metallic green ..*Habrocytus*

6. (3) Legs nearly uniform in coloration, either white, yellow, or tan 7
   Legs marked with contrasting colors, white and black or white and brown 8

7. (6) Face below antennae black; eyes gray or black .....*Hyssopus*
   Face below antennae white; eyes purple ....*Euplectrus*

8. (6) Vertex of head rounded 9
   Vertex of head pointed .....*Copidosoma*

MAINTAINED AT ST. PAUL 1, MINNESOTA, IN COOPERATION WITH THE UNIVERSITY OF MINNESOTA

9. (8) Forewing with small vein extending into membrane (Figs. 1, 2); metathoracic femora rounded 10
Forewing without vein extending into membrane (Fig. 3); metathoracic femora flattened .....*Elasmus*

10. (9) Vein in forewing membrane thick and prominent (Fig. 1); femur-tibia knee joint white .....*Tetrastichus*
Vein in forewing membrane thin (Fig. 2); femur-tibia knee joint black or brown .....
.....*Pediobius*

11. (1) Face below antennae between eyes partly or completely white or yellow 12
Face below antennae between eyes completely black or brown 16

12. (11) Head, thorax, and abdomen black in part; dorsal abdomen completely black 13
Head, thorax, and abdomen brown; abdominal dorsum yellow or brown .....*Mesochorus*

13. (12) Metathoracic tibia black and white or black and yellow; white or yellow spot present on thoracic dorsum 14
Metathoracic tibia nearly uniform in coloration; white or yellow spot absent on thoracic dorsum 15

14. (13) Eye emarginate, and thin white markings along inner margin of eye (Fig. 10); tip of ovipositor of female curved downwards .....*Ephialtes*
Eye entire, and white markings on lower half of face (Fig. 11); tip of ovipositor of female straight. .....*Aoplus*

15. (13) Forewing with areolet (Fig. 4); (male insect) .....*Phaeogenes*
Forewing without areolet (Fig. 5); (male or female insect) .....*Exochus*

16. (11) Head and thorax black 17
Head and thorax light or dark brown 24

17. (16) Tibiae and tarsa of metathoracic legs banded white and brown 18
Tibiae and tarsa of metathoracic legs not banded 20

18. (17) Eye entire; abdomen black without markings 19
Eye emarginate (Fig. 12); abdomen black with narrow yellow bands bordering the posterior margin of each segment .....*Itoplectis*

19. (18) Forewing with areolet (Fig. 6); antennae dark brown. .....*Scambus*
Forewing without areolet; antennae black .....*Glypta*

20. (17) Dorsal abdomen completely black ...21
Dorsal abdomen brown or brown and black..23

21. (20) Forewing with areolet; eye emarginate 22
Forewing without areolet; eye entire .....
.....*Apanteles*

22. (21) Femora, tibiae, and tarsa of metathoracic legs uniform in coloration ....*Horogenes*
Femora of metathoracic legs light brown, tibiae and tarsae dark brown ..*Coccygomimus*

23. (20) Antennae brown without markings (male or female insect) .....*Hemiteles*
Antennae brown with several control segments white, (female insect) ....*Phaeogenes*

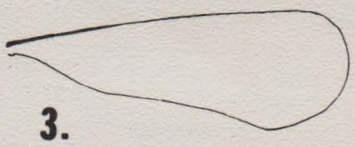
24. (16) Wing membranes transparent 25
Wing membranes pictured with opaque markings .....*Gelis*

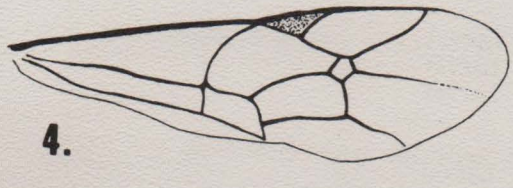
25. (24) Antennae as long or longer than length of body 26
Antennae shorter than length of body .....
.....*Hormius*

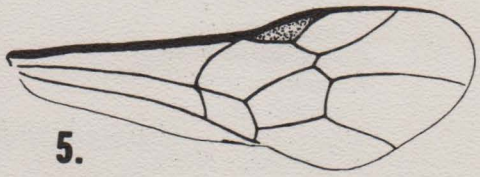
26. (25) Forewing with large cells only 27
Forewing with one small cell, similar to areolet (Fig. 7) .....*Meteorus*

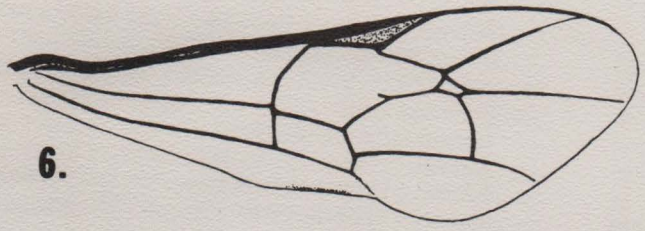
27. (26) Eye entire; abdomen either totally black or brown with one or more yellowish segments 28
Eye with shallow emargination (Fig. 13); abdomen brown .....*Clinocentrus*

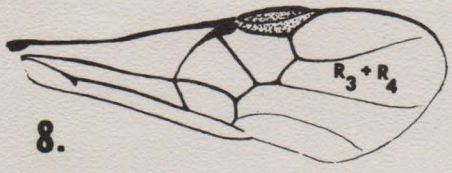
28. (27) Forewing with cells R_3 and R_4 confluent (Fig. 8) .....*Eubadizon*
Forewing with cells R_3 and R_4 separated by cross vein (Fig. 9) .....*Macrocentrus*

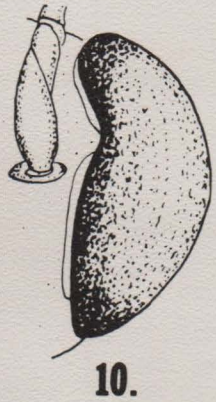


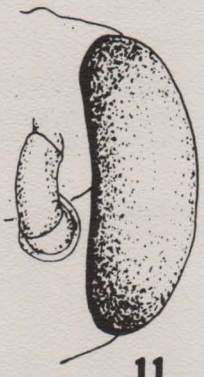












FIGURES 1-9 illustrate the right forewings, and figures 10-13 the left side of head (front view).

1. *Tetrastichus*
2. *Pediobius*
3. *Elasmus*
4. *Phaeogenes*
5. *Exochus*
6. *Scambus*
7. *Meteorus*
8. *Eubadizon*
9. *Macrocentrus*
10. *Ephialtes*
11. *Aoplus*
12. *Itoplectis*
13. *Clinocentrus*

TABLE 1. *Species and type of hymenopterous parasites reared from the spruce budworm in northern Minnesota, 1956-1961*

Classification	Type of parasite
Braconidae	
Apanteles fumiferanae Vier.	Egg, larval
A. petrovae Walley	——
A. polychrosidis Vier.	Egg, larval
A. near *solenobiae* Walley	Larval
Apanteles n. sp.	——
Clinocentrus sp.	Larval
Clinocentrus n. sp.	Larval
Eubadizon gracile Prov.	Larval
Hormius sp.	——
Macrocentrus iridescens French	——
M. peroneae Mues.	Larval
Meteorus trachynotus Vier.	Larval
Elasmidae	
Elasmus sp.	Larval (hyperparasite)
Encytridae	
Copidosoma deceptor Miller	——
Copidosoma sp.	——
Eulophidae	
Euplectrus frontalis Howard	Larval
Hyssopus johannseni (Cwfd.)	Larval
Pediobius tarsalis (Ashm.)	Larval (hyperparasite)
Tetrastichus caerulescens Ashm.	Larval (hyperparasite)
T. silvaticus Gah.	Larval
Ichneumonidae	
Aoplus near *vagans* (Prov.)	Larval (?)
Coccygomimus pedalis (Cress.)	Pupal
Ephialtes ontario (Cress.)	Pupal
Exochus sp.	Larval
Gelis sp.	Larval (hyperparasite)
Glypta fumiferana (Vier.)	Egg, larval
Hemiteles sp.	——
Horogenes sp.	Egg, larval
Itoplectis conquisitor (Say)	Pupal
Mesochorus sp.	Egg, larval (hyperparasite)
Phaeogenes hariolus (Cress.)	Pupal
Scambus alboricta (Cress.)	Larval
Pteromalidae	
Amblymerus verditer (Nort.)	Pupal (hyperparasite)
Habrocytus phycidis Ashm.	Pupal (hyperparasite)
Psychophagus tortricis (Brues.)	Pupal (hyperparasite)
Trichogrammatidae	
Trichogramma minutem Riley	Egg

October, 1964

LOUIS F. WILSON,
Lake States Forest Experiment Station
JAMES L. BEAN,
Eastern Region, Upper Darby, Pa.